AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions and listings in the application.

Listing of Claims:

1. (Currently amended) A distributed data processing system for controlling allocation of resources and controlling task execution, said system ~~and~~ comprising:

a communications network for transmitting ~~passing~~ messages ~~between computers connected thereto~~;

a plurality of computers connected to said communications network for executing ~~running~~ programs ~~thereon~~, said plurality of computers including a central authority computer, ~~and at least~~ a first autonomous agent computer, and a second autonomous agent computer ~~agents~~;

said central authority computer generating ~~generates~~ a first graph associated with said first agent computer and a second graph associated with said second agent computer, ~~each agent wherein the graph represents for the associated agent what resources that agent has and what task or tasks that agent may perform;~~ said first graph representing resources and performable tasks of said first agent computer, said second graph representing resources and performable tasks of said second agent computer,

said first agent computer employing said first graph to determine resources necessary for performing tasks required by said first agent computer, said second agent computer employing said second graph to determine resources necessary for performing tasks required by said second agent computer,

~~each said agent employs the associated said graph to determine what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent; and,~~

said first agent computer negotiating with said second agent computer for obtaining resources necessary for executing tasks required by said first agent computer, said second agent computer negotiating with said first agent computer for obtaining resources necessary for executing tasks required by said second agent computer. ~~said agents negotiate with each other for the resources needed to carry out the task or tasks to be performed by said agents.~~

said central authority computer receiving mission objectives described in terms of rewards associated with task results and costs described in terms of consumption of basic resources.

2. (Currently amended) A system as set forth in claim 1 wherein said central authority computer generates said first and second graphs from ~~received~~ data ~~including data~~ representing models of tasks mapped to task types.

3. (Currently amended) A system as set forth in claim 1 wherein said central authority computer generates said first and second graphs from ~~received~~ data ~~including data~~ representing number and type of resources.

4. (Currently amended) A system as set forth in claim 1 wherein said central authority computer generates said first and second graphs from ~~receeived~~ data ~~including data~~ representing number and type ~~types and number~~ of tasks.

5. (Currently amended) A system as set forth in claim 4 wherein said ~~receeived~~ data ~~further~~ includes ~~data representing~~ models of tasks mapped to task types and ~~data representing~~ number and type of resources.

6. (Currently amended) A system as set forth in claim 1 wherein said central authority computer receives data ~~including data~~ representing mission constraints, said data including linear inequalities in terms of resource and task ~~resources and tasks~~ results.

7. (Currently amended) A system as set forth in claim 6 wherein said central authority computer generates a supervisory control structure for enforcing ~~to enforce~~ constraint dependencies based on ~~receeived~~ data ~~including that~~ representing mission constraints and said first and second graphs.

8. (Canceled)

9. (Canceled)

10. (Currently amended) A system as set forth in claim 7 ~~9~~ wherein said ~~receeived~~ data further represents ~~includes data~~

~~representing~~ models of tasks mapped to task types, ~~and data representing~~ number and type of resources, and number and type ~~and types and numbers~~ of tasks.

11. (Canceled)

12. (Currently amended) A system as set forth in claim 1 ~~11~~ wherein said central authority computer assigns penalties for resource consumption and rewards for ~~all~~ subtask results based on data ~~received including that~~ representing mission objectives.

13. (Currently amended) A system as set forth in claim 12 wherein said central authority computer receives data representing locations of potential agent processors, ~~and~~ locations of resources, and locations of ~~and~~ potential task implementers.

14. (Currently amended) A system as set forth in claim 13 wherein said central authority computer decomposes an overall model for distribution among the said first and second agent computers. ~~individual agents.~~

15. (Currently amended) A system as set forth in claim 14 wherein said central authority computer determines whether said first agent computer and said second agent computer have ~~if any agent has not~~ received initial data, said central authority computer sending ~~and if not, then it sends~~ the

initial data to said first agent computer if said first agent computer has not received the initial data, said central authority computer sending the initial data to said second agent computer if said second agent computer has not received the initial data. ~~the structure and initial conditions, task and resource mappings and the number and type of resources to that agent.~~

16. (Currently amended) A system as set forth in claim 15 wherein said central authority computer determines if said first agent computer has ~~any agents have~~ not been updated, and if not, said central authority computer ~~so it~~ sends to said first agent computer ~~any such non-updated agent the~~ data regarding resources, usage costs, and task completion rewards. ~~reward.~~

17. (currently amended) A system as set forth in claim 16 wherein said central authority computer receives incoming ~~agent~~ messages from said first agent computer and provides user feedback to said first agent computer.

18. (Currently amended) A system as set forth in claim 17 wherein said central authority computer determines whether a ~~the~~ mission has been completed.

19. (Currently amended) A method operative in a distributed data processing system, said method comprising the steps of: ~~for~~

controlling allocation of resources; ~~and~~

controlling task execution; ~~and~~

employing a communications network for passing messages between computers, the computers being ~~connected thereto and wherein said computers are~~ operative to run programs, the computers ~~thereon~~ including a central authority computer, ~~and~~ a ~~at least~~ first autonomous agent computer, and a second autonomous agent computer; ~~agents comprising the steps of: at said central authority,~~

generating a first graph associated with the first agent computer, the first graph representing resources and tasks for the first agent computer;

generating a second graph associated with the second agent computer, the second graph representing resources and tasks for the second agent computer; ~~each agent and representing for that agent what resources that agent has and what task or tasks that agent may use the resources for;~~

employing the first graph by the first agent computer to determine resources required to perform tasks; ~~each said agent employing the associated said graph for determining what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent; and,~~

employing the second graph by the second agent computer to determine resources required to perform tasks;

negotiating with the second agent computer by the first agent computer for resources required to perform tasks;

~~said agents negotiating with each other for the resources needed to carry out the task or tasks to be performed by said agents.~~

negotiating with the first agent computer by the second agent computer for resources required to perform tasks; and

assigning, by the central authority computer, penalties for resource consumption and rewards for subtask results based on data representing mission objectives described in terms of rewards associated with task results and basic resource costs.

20. (Currently amended) A method as set forth in claim 19 wherein said ~~step of~~ generating steps include ~~said graphs includes~~ generating the first and second ~~said~~ graphs from ~~received~~ data ~~including data~~ representing models of tasks mapped to task types.

21. (Currently amended) A method as set forth in claim 20 wherein said ~~step of~~ generating steps include ~~a graph includes~~ generating the first and second graphs ~~said graph~~ from data representing number and type of resources.

22. (Currently amended) A method as set forth in claim 21 wherein the first and second graphs include ~~said step of generating steps said graphs from received data includes~~ data representing models of tasks mapped to task types.

23. (Currently amended) A method as set forth in claim 19 wherein the ~~said~~ central authority computer generates supervisory control structure to enforce constraint dependencies based on ~~received data including~~ data representing linear inequalities in terms of resources and task results and data representing mission constraints.

24. (Canceled)

25. (Currently amended) A method as set forth in claim 23 ~~24~~ wherein the ~~said~~ central authority computer decomposes an overall graph for distribution among the first and second agent computers ~~individual agents~~ based on ~~received data including~~ data representing locations of potential agent processors, ~~and~~ locations of resources, and locations of potential task implementers.

26. (Currently amended) A method as set forth in claim 25 further including the step of determining whether the first and second agent computers have been ~~any agents were not~~ initialized and, if not, ~~then for a non-initialized agent~~ sending ~~its~~ structure, ~~and~~ initial conditions, task and

resource mappings, and the number and type of resources to the first and second agent computers. ~~that agent.~~

27. (Currently amended) A method as set forth in claim 26 further including the step of determining whether the first and second agent computers ~~any agents~~ have ~~not~~ been updated and, if not, ~~for each non-updated agent,~~ sending ~~to that agent~~ ~~the~~ resource usage cost data and task completion reward data to the first and second agent computers.

28. (Currently amended) A method as set forth in claim 27 further including the steps of: ~~step of~~

receiving incoming ~~agent~~ messages; ~~and then~~

providing user feedback data; and ~~then~~

determining whether a ~~the~~ mission has been completed.

29. (Currently amended) A computer program product stored in a computer readable medium, said product being operative in a distributed data processing system for controlling allocation of resources and for controlling task execution, the system including ~~wherein the system includes~~ a communications network, said product comprising: ~~for passing messages between computers connected thereto and wherein said computers are connected to said network for running programs thereon including~~

a central authority node ~~and at least first and second autonomous agents; and comprising:~~

a first autonomous agent node; and

a second autonomous agent node,

said central authority node generating a first graph for said first agent node and a second graph for said second agent node, said first graph representing resources and tasks for said first agent node, said second graph representing resources and tasks for said second agent node, ~~a central authority that generates a graph associated with each agent wherein the graph represents for the associated agent what resources that agent has and what task or tasks that agent may use the resources for;~~

said first agent node employing said first graph for determining required resources for performing tasks by said first agent node, said second agent node employing said second graph for determining required resources for performing tasks by said second agent node, ~~first and second agents, each said agent employs the associated said graph to determine what resource or resources are needed by that agent to carry out the task or tasks to be performed by that agent; and,~~

said first agent node negotiating with said second agent node for resources required to perform tasks by said first agent node, said second agent node negotiating with said first agent node for resources required to perform tasks by said second agent node, ~~said first and second agents negotiate with each other for the resources needed to carry out the task or tasks to be performed by said agents.~~

said central authority node receiving data representing mission objectives described in terms of rewards

associated with task results and costs described in terms of consumption of basic resources.

30. (Currently amended) A product as set forth in claim 29 wherein said central authority node generates said first and second graphs from ~~received data including~~ data representing models of tasks mapped to task types.

31. (Currently amended) A product as set forth in claim 29 wherein said central authority node generates said first and second graphs from ~~received data including~~ data representing number and type of resources.

32. (Currently amended) A product as set forth in claim 29 wherein said central authority node generates said first and second graphs from ~~received data including~~ data representing number and type ~~types and number~~ of tasks.

33. (Currently amended) A product as set forth in claim 32 wherein said ~~received~~ data represents ~~further includes data representing~~ models of tasks mapped to task types and ~~data representing~~ number and type of resources.

34. (Currently amended) A product as set forth in claim 29 wherein said central authority node receives data ~~including data~~ representing mission constraints, said data including linear inequalities in terms of resources and task ~~tasks~~ results.

35. (Currently amended) A product as set forth in claim 34 wherein said central authority node generates supervisory control structure to enforce constraint dependencies based on ~~received~~ data ~~including that~~ representing said mission constraints and said first and second graphs.

36. (Currently amended) A product as set forth in claim 29 wherein said central authority node receives data ~~including data~~ representing mission constraints, said data including linear inequalities in terms of resources and task ~~tasks~~ results.

37. (Currently amended) A product as set forth in claim 36 wherein said central authority node generates supervisory control structure to enforce constraint dependencies based on ~~received~~ data ~~including that~~ representing said mission constraints and said first and second graphs.

38. (Currently amended) A product as set forth in claim 36 wherein said ~~received~~ data represents ~~further includes data representing~~ models of tasks mapped to task types and ~~data representing~~ number and type of resources.

39. (Canceled)

40. (Currently amended) A product as set forth in claim 29 ~~39~~ wherein said central authority node assigns penalties for resource consumption and rewards for ~~all~~ subtask results based on ~~data received including that representing~~ mission objectives.

41. (Currently amended) A product as set forth in claim 40 wherein said central authority node receives data representing locations of potential agent processors, ~~and~~ locations of resources, ~~and~~ locations of potential agent processors, ~~and~~ locations of resources, and locations of potential task implementers.

42. (Currently amended) A product as set forth in claim 41 wherein said central authority node decomposes an overall ~~PN~~ model for distribution among said first and second agent nodes. ~~the individual agents.~~

43. (Currently amended) A product as set forth in claim 42 wherein said central authority node determines whether said first and second agent nodes have ~~if any agent has not~~ received initial data, and if not, said central authority node ~~then it~~ sends ~~the~~ structure, ~~and~~ initial conditions, task and resource mappings, and ~~the~~ number and type of resources to said first and second agent nodes. ~~that agent.~~

44. (Currently amended) A product as set forth in claim 43 wherein said central authority node determines whether said first and second agent nodes ~~if any agents~~ have ~~not~~ been updated, and if not, said central authority node ~~so it~~ sends resource usage costs and task completion rewards to said first and second agent nodes. ~~to any such non-updated agent the resources usage costs and task completion reward.~~

45. (Currently amended) A product as set forth in claim 44 wherein said central authority node receives incoming ~~agent~~ messages from said first agent node and provides ~~user~~ feedback to said first agent node.

46. (Currently amended) A product as set forth in claim 45 wherein said central authority node determines whether a ~~the~~ mission has been completed.